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ABSTRACT

The use of motor ability tests to achieve sex-fair ability groups should be considered from three standpoints--task specificity, sex differences, and individual learning differences. Motor ability is frequently described as an individual's present ability to perform motor skills. Although several motor ability tests have been constructed for secondary students, many of the tests were separate and gender-specific. The appropriateness of the experimental design, statistics, and methodology employed in the construction of many of these tests is questionable. Several factors mitigate against the use of ability tests for classification purposes. One is the theory that abilities are task specific rather than general in nature. A second factor is the basic gender differences that currently exist on certain dimensions of motor performance, primarily strength and endurance. These differences would probably lead to differences in motor ability test scores and to ability grouping by sex. Differences in rate and amount of student learning reduce the value of classifying students into discrete groups according to natural ability. Motor ability tests have limited value in the classification of secondary students and are not suitable for delineating sex-fair ability groups. (Authors/JD)

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THE USE OF MOTOR ABILITY TESTS TO ACHIEVE SEX-FAIR ABILITY GROUPINGS

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THE USE OF MOTOR ABILITY TESTS TO ACHIEVE SEX-FAIR ABILITY GROUPINGS

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ABSTRACT

The use of motor ability tests to achieve sex fair ability groups should be considered from three standpoints - task specificity, sex differences, and individual differences in learning. While motor ability has been defined in many ways, this construct is frequently described as an individual's present ability to perform motor skills. Although a number of motor ability tests have been constructed for junior and senior high school students, separate tests were developed for male and female students. The appropriateness of the experimental design, statistics, and methodology employed in the construction of many of these tests is questionable. However, even if tests were designed for use by both sexes, several factors mitigate against the use of ability tests for classification purposes. One is the theory that abilities are task specific rather than general in nature. There is extensive documentation supporting this point of view in the literature. A second factor is the basic gender differences that currently exist on certain dimensions of motor performance, primarily strength and endurance. These differences would probably lead to differences in motor ability test scores and, thus, to ability grouping by sex. Finally, differences in rate and amount of student learning reduce the value of classifying students into discrete groups according to natural ability. Thus, motor ability tests have limited value in the classification of junior and senior high school students in general and are not suitable for delineating sex-fair ability groups.

For many years, the separation of boys and girls in physical education programs in this country was a common practice, especially in junior and senior high schools. During the early part of the 20th century, several affluent communities even provided separate gymnasia and swimming pools for boys and girls. When the Title IX legislation was adopted, many schools attempted to comply with this law by offering a substantial number of coeducational classes. However, Title IX does not specifically stipulate that physical education classes must be coeducational. In fact, the law allows "separation by sex within physical education classes during competition in wrestling, boxing, ice hockey, football, basketball and other sports, the purpose or major activity of which involves bodily contact" (Federal Register, p. 24132). On the other hand, the more general and pervasive policy dictates the use of ability grouping in physical education with the understanding that group membership is determined on the basis of individual performance rather than sex.

To implement this legislation effectively, physical educators need to provide answers to two questions: (1) What types of tests should be used to group students on the basis of ability? (2) What guidelines can be used to set performance standards for these tests? The first of these two questions is one of the major topics of the Physical Education Ability Grouping and Performance Evaluation Symposium. Three types of tests will be examined during this Symposium - motor ability, skill/activity, and physical

fitness (health-related). In this paper, the use of motor ability tests to achieve sex fair ability groups will receive primary focus.

A thorough review of the literature on motor ability tests reveals a plethora of instruments developed, for the most part, between 1920 and 1960. What was the purpose of these tests? Were they developed according to rigorous psychometric standards? Why did the development of motor ability tests come to a complete halt during the last two decades? Finally, can these tests be used to classify students into sex fair ability groups? In the first section of this paper, several definitions of motor ability will be examined; then, a brief description and critique of motor ability tests will be presented. Finally, the use of motor ability tests to achieve ability groupings will be discussed from three standpoints - task specificity, sex differences, and individual differences in rate of learning and amount of learning over time.

Definition of Motor Ability

Motor ability, motor educability, and motor capacity, while somewhat related in meaning, are distinct terms which, to the confusion of the practitioner, have often been used interchangeably in the motor ability literature. Motor ability has been defined as "a present aptitude for physical skills" (Alden, Horton, & Caldwell, 1932) which includes strength and coordination as they appear in everyday motor habits (Howe, 1930). Similarly, McCloy (1934) distinguished between general motor ability--motor capability at a given time--and general motor capacity--one's potential motor capability. Humiston (1937), taking a different

approach, described motor ability as the "ability to get around in situations demanding the use of big muscles--the ability to shift the body from one place to another" (p. 182) while Brock et al. (1941) complicated the issue by defining motor ability as a general capacity to learn motor activities and specific areas of learning experience. Scott and French (1959) meanwhile linked motor ability and motor educability in describing motor ability as "achievement in basic motor skills, or it may be interpreted as a more general term combining the concepts of motor educability and achievement" (p. 343). Motor educability has been defined as the ease with which one learns motor skills (Singer, 1969). However, some authors equate motor capacity with motor educability (Mood, 1980).

Synthesizing the above information it appears that motor capacity refers to an individual's potential to perform motor skills, motor ability refers to an individual's present ability to perform motor skills, and motor educability deals with an individual's ability to learn new motor skills. More recent descriptions of motor ability were presented by Singer (1969) and Kirkendall et al. (1980). Singer described motor ability as indicating present athletic ability and denoting "the immediate state of the individual to perform in a wide range of motor skills" (p. 107). Kirkendall et al. (1980) likened the logic of motor ability in physical education to that of the IQ concept in psychology in that the "logic involved is: If a child cannot play a game well, she has not yet developed her general motor abilities" (p. 214). These authors then

described motor ability as "a general quality that can facilitate more specific future performances" (p. 213).

Perhaps the most difficult challenge in constructing a test of motor ability is the determination of elements of motor ability. McCloy (1940) presented ten such elements as follows: muscular strength, dynamic energy, ability to change direction, flexibility, agility, peripheral vision, good vision, concentration, understanding the mechanics of the activity, and absence of disturbing complications. Clarke (1976) listed nine elements of general motor ability: arm-eye coordination, muscular power, agility, muscular strength, muscular endurance, circulo-endurance, flexibility, speed, and foot-eye coordination. However, the benefits of examining lists of this type are limited since each test developer has identified a different set of elements representing general motor ability. This paradox has never been resolved, although it is obviously contradictory to discuss "general" motor ability and then to describe the components of motor ability in a multitude of different ways. In fairness to these authors, however, it should be noted that there are a number of commonalities across sets of components.

Motor Ability Tests

The concept "motor ability" implies an enduring trait which indicates one's present ability for most athletic activities. Therefore, researchers in the first half of this century attempted to develop tests which measured this trait for the purposes of classifying individuals for instruction and predicting future

athletic success. Furthermore, the development of separate motor ability tests for male and female students beyond elementary school age has been a generally consistent trend. Before discussing the technical aspects of these tests in more detail, several of the most widely used motor ability tests for junior and senior high school students will be described.

McCloy's General Motor Ability Test (McCloy, 1934)

Boys: (events vary according to the age and experience of the group)

1. Pull-up or chinning
2. Sprint (50 to 100 yards)
3. Long jump (running or standing)
4. Running high jump
5. Weight throwing (shot-put, basketball throw, or baseball throw)

General Motor Ability Score = .1022 (track and field score) - 3928 (chinning strength)

Girls:

1. Modified pull-ups
2. Sprint
3. Long jump
4. Throw

General Motor Ability Score = .42 (track and field score) + 9.6 (number of pull-ups)

Scott Motor Ability Test for High School Girls (Scott, 1939)

Battery 1:

a) Basketball throw for distance
b) Four second dash
c) Basketball wall pass
d) Standing broad jump

General Motor Ability Score = .7 (basketball throw) + 2.0 (dash) + 1.0 (passes) and 1.5 (broad jump)

Battery 2:

a) Basketball throw for distance
b) Standing broad jump
c) Obstacle race

General Motor Ability Score = 2.0 (basketball throw) + 1.4 (broad jump) - 0.0 (obstacle race)

Barrow Motor Ability Test for Junior and Senior High School Boys (Barrow, 1954)

a) Standing long jump
b) Zig zag run
c) Medicine ball put

Turning first to an examination of the construct validity of these tests, the underlying assumption of the existence of a latent trait called "motor ability" has never been firmly substantiated through a rigorously developed network of scientific evidence. Moreover, the use of the label "trait" in describing motor ability suggests that this ability is an enduring and unchanging dimension of motor behavior. Yet, it is evident that the items included in motor ability tests can be improved with practice; thus, these items cannot measure innate motor ability. This is the reason some physical educators are only interested in assessing motor ability as it is reflected in an individual at a given point in time. Once this view of motor ability is adopted, however, this ability can no longer be viewed as a trait or an innate ability. Of course, these same problems face researchers in the areas of intelligence testing and affective measurement. Barrow and McGee (1980) observed that, even though motor ability improves with training, experience and maturity, individual differences in students tend to remain the same through the school level. No documentation was provided in support of this observation.

The appropriateness of the experimental design, statistics, and methodology employed in the construction of many motor ability tests is open to debate. This is not to criticize the authors of such

tests for, as Singer (1969) rightly points out, "many of those older studies employed research techniques that, although sound at the time, might be questioned in the light of present knowledge in research methodology" (p. 112). Generally, the methodology utilized by these studies is as follows. In order to develop a list of the important components of motor ability, physical education professionals or previously validated motor ability tests were sampled. For each element of motor ability a test item which appeared to reflect the element was either developed or borrowed from other tests (e.g., a 50-yard sprint to reflect the speed element). A target population (e.g., college women) was chosen and all the test items were administered to a sample of that population. In most studies item scores were transformed into standardized "T" scores. A composite motor ability score consisting of the "T" values summed or averaged over all items was then calculated. This composite score became the criterion score for test validation along with other criteria such as subjective ratings of an individual's innate motor capacity, sport skills scores, and achievement in athletics. Validity was determined by correlating the "T" scores for individual items with the composite motor ability "T" score or with a combination of the composite "T" score and other criteria scores. In order to find a reduced set of motor ability items multiple correlations between subsets of "validated" items and the composite "T" score were calculated. The reliability of the test, when reported, was most often determined via stability over time.

Perhaps the greatest fault with such a methodology is the use of composite standardized score as a criterion. Cumbee and Harris (1953) pointed out that such a criterion represents only one of several factors if the interrelationships of the set of independent variables have a rank greater than one. Therefore if a set of items is best represented by more than one factor a single composite does not provide all the information provided by the item scores. The authors conclude that a systematic analysis of item interrelationships via factor analysis would better facilitate the development of criterion measures. A second drawback of the methodology is the use of multiple correlations which become inflated because the same items appear in both the subset and the composite score.

Motor Ability Tests and Ability Grouping

Many physical educators currently specializing in the measurement of motor behavior have recognized the need for tests to be used in grouping individuals for participation in a physical activity program; several have recommended using motor ability tests for this purpose for certain types of programs. Clarke (1976) is a strong proponent of ability grouping by general abilities in a physical education program where "the activities may vary either within a single class period or from day to day, or where the same activity does not continue on consecutive days for more than a week or two at most" (p. 229). Even if the methodological problems discussed in the previous section are ignored, what is the utility of

motor ability tests for classifying students in general and, can these classifications be justified as sex-fair?

Several factors mitigate against the use of ability tests for classification purposes - task specificity, sex differences, and individual differences. As early as 1934 researchers began questioning the concept of general motor ability in favor of task specificity. Ragsdale and Breckenfield (1934) in an investigation of junior high school boys concluded that "it is probably incorrect to speak of general motor ability in the same sense that we speak of general intelligence. In this study we have distinguished two general factors which we have called strength and speed in running" (p. 54). In a study of the motor ability of college men Hoskins (1934) reported low correlations between motor ability as measured by the McCloy test and subjective ratings of athletic skill in several activities. In direct contrast, McCloy (1934) reported correlations of .92 between his track and field items and subjective ratings of basketball skill and .84 between these items and subjective ratings of soccer skill. A year later Jones (1935) obtained low correlations between several motor ability items while Seashore (1942) distinguished between fine and gross motor abilities. In the late 1950's the task specificity concept gained impetus with the work of Franklin Henry. Henry (1958) argued:

> The theory of specific motor abilities implies that some individuals are gifted with many specific abilities and others with only a few; it follows that there will inevitably be significant correlations between total test battery scores when tests involving many abilities are lumped together. The general motor factor which thus makes its appearance is a sample, fundamentally, of how many specifics the individual has, and general motor ability does exist in this sense (p. 127).

Support for Henry's specificity argument came swiftly. Lotter (1961) in test of 80 college men found that the neuromotor specificity of speed of movement ability of arms and legs was extremely high. Lotter stated that "task specificity ... implies that it is largely a matter of chance whether an individual who has relatively high (or low) ability in one motor task will have a high or low ability in another motor task unless the two tasks are so similar as to be practically identical" (p. 57). Further evidence for task specificity can be found in studies which reveal that general motor ability test scores do not correlate highly with various sport skills. Singer (1969) has prepared an excellent review of this literature. One example of such research is a study by Burdeshaw et al. (1970), who used the Scott Motor Ability Test to classify 106 college women as a low motor ability group. This group was subdivided into three groups: Group One received a basic skills course; Group Two, a sport course other than badminton; and Group Three, no special treatment. All groups were subsequently enrolled in a badminton course. Testing at the midpoint and end of the badminton course revealed no difference between groups. The authors concluded that the "results supported the theory of specificity in motor skills and did not support the worth of basic skills courses in facilitating subsequent performance in the specific skills of badminton" (p. 472).

The utility of motor ability tests to achieve sex-fair groupings is not supported in the literature. Historically, the development of

motor ability tests has proceeded separately for girls and boys beyond elementary school age. Although not specifically stated in the literature, the determing factor of this development appears to be strength differences between the sexes. Powell (1940) noted that Roger's Strength Indices were less satisfactory for classifying girls and women and recommended that motor ability tests which deemphasized the strength factor be developed specifically for girls and women. Singer (1969) reported that boys have only a slight edge over girls in grip strength up to 12-13 years of age. After this point boys evidence a great increase in strength and body size accompanied by an increase in performance until the late teens. Girls tend to level off in grip strength and performance (with the exception of motor coordination skills) by age 15. Thus in junior and senior high school age range there exist wide differences in the strength and performance of males and females. Motor ability tests will tend to separate males from females on the basis of the strength factor.

An overview of the research on gender differences in motor performance is presented in a paper by Safrit et. al. (1980). These differences were categorized as physical performance differences, body structure and composition differences, and differences in cardio-respiratory function. The authors concluded that, based on normative evidence, true gender differences exist for many forms of motor behavior. Whether these differences are primarily biological or cultural in nature is largely unresolved.

Even if the use of motor ability tests for sex-fair ability

grouping could be justified, physical educators would face the practical problem of developing valid motor ability tests for both boys and girls. When separate programs existed for boys and girls, it apparently seemed reasonable to develop separate motor ability instruments, one for each sex. Thus, although a number of tests have been developed for junior and senior high school students, none of these were designed to be administered to both boys and girls. Certainly ability groupingwill not be sex fair unless the same test is used to classify all students.

Finally, differences in the rate and amount of student learning over time reduce the value of classifying students into discrete groups according to motor ability (Kirkendall et al., 1980). Because some individuals learn more and learn at a faster rate than others the original classification scheme would have little meaning as the instructional unit progressed.

Conclusion

Motor ability tests have limited value in the classification of junior and senior high school students in general and are not suitable for delineating sex fair ability groups. As Kirkendall et al. (1980) so aptly stated:

> ... learning of any type is always based on a foundation of prior experience. As one gets older and progresses through the many motor tasks of childhood, physical activities and skills become more and more specific. Specificity of skills is seen in the low relationship between initial and final score studies. Teaching is more of an art than a science. If you want to classify for instruction, select a test that simulates the particular sport or activity to be learned .... Do not 'pigeonhole' or

'type' a person into a category for a long time because of a preinstruction test score. This action may keep a student in the wrong group and result in low achievement levels, it could also have unfavorable emotional repercussions on the pupil (p. 216).

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